REMARKS

This case has been carefully reviewed and analyzed in view of the Official Action dated June 15, 2005.

The Examiner has objected to claims 1-8 because of informalities. Claims 1-8 have been canceled and replaced with new claims 9-11 in order to overcome the objection.

Further, the Examiner has claim 6 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-8 have been canceled and replaced with new claims 9-11 in order to overcome the rejection.

Moreover, the Examiner has rejected claims 1-8 under 35 U.S.C. 102(b) as being anticipated by Krenzer. Nevertheless, it is respectfully requested that this rejection be withdrawn in light of the following reasons.

Krenzer discloses a process of forming longitudinally curved teeth of bevel and hypoid gears, wherein a dish-shaped tool is oscillated relative to a work gear with the oscillating causing the dish-shaped tool to swing through an arc corresponding to the longitudinally curved teeth of the work gear. Nonetheless, this reference fails to teach or suggest a modified radial motion (MRM) method for modifying lengthwise curvature of face-milling spiral bevel and hypoid gears capable of modifying lengthwise curvature of face-milling spiral bevel and hypoid gears by providing modified radial motion of a head cutter and by cooperating with rotation of a cradle without changing the head cutter's geometry; wherein the modified radial motion of the head cutter and a rotation angle of the cradle are nonlinear functions of a rotation angle of work-gear and a rotation angle of the cradle, a locus of the head center is achieved by a constant radial setting and by modifying a vertical distance E_m between work-gear-axis *c-c* and cradle-axis *a-a*, a coefficient of the high-order

polynomial formula form of the modified radial motion of the head cutter and the rotation angle of the cradle is determined by amount of correction at an arbitrary position on a tooth face, the head cutter is adjusted along unit normal of tooth surface of the cutter, a new position of the cutter center in machine plane will be correspondingly decided, and new positions of the head cutter center in machine plane will be correspondingly decided after giving amounts of correction at plural positions to be corrected, with the new positions, the coefficient of the high-order polynomial form of the modified radial motion of the head cutter and rotation angle of the cradle will be determined; whereby during the process of modifying the lengthwise curvature, radial setting of the head cutter will change with the rotation of the cradle, and a rotation center of the head cutter will trace a circular arc in a machine plane if radial setting is constant, so that an adjustability of gear set will be improved without changing the bearing ratio. Furthermore, the comparison between Krenzer and the present invention is described as follows:

	KRENZER	THE PRESENT INVENTION
Ways	1. Being used in formate method (see Illustration 1) 2. Suitable for gears	1. Being used in generate method (see Illustration 1) 2. Suitable for both pinions and gears.

Functions

1. A processing of imaged gear tooth surface correction is done by reciprocating curve motion which milling cutter axis is inclining toward the	1. Imaged gear tooth surface correction is done by radius of tool position on movable workholder plane and anger

theoretical cutter axis corresponding to that of cutter and moving along gear root linear direction of work gear. 2. There is no relationship between the motion of imaged gear and that of work gear (see Illustration 2).	of swiveling table. 2. There is relationship between the motion of imaged gear and that of work gear (see Illustration 2).
Results	
Obvious change in tooth contact bearing ratio (see Illustration 3).	Almost no change in tooth contact means some improvement (see Illustration 3).

<u>Illustration 1</u>

By the technical experience, in processing of a work gear 12 with face-milling method as shown in figure 1, the tip of tool 2 rotates with milling cutter rotary axis 4 along root line 8. Either formate method or generate method in arrangement of tool 2 with work gear 12 is working. As far as formate method is concerned, during the milling of work gear 12, the work gear 12 and the swiveling table are fixed without rotation. Nevertheless, during the milling of work gear 12 with generate method, the work gear 12 and the swiveling table rotate with a particular speed ratio each other at the same time.

As in Krenzer patent (US-5,088,243), when milling a gear 12 as shown figure 2, the tool 2 rotating axis 4 inclined an anger D with tool theoretical rotating axis (swing table axis) 6, the tool 2 rotates not only with its own rotating axis 4, but also oscillates with tool theoretical rotating axis 6, at this time the work gear 12 and the

tool theoretical rotating axis (swing table) are fixed without rotation. So the modified lengthwise curvature method in Krenzer's patent (US5, 088,243) is formate method. As the present invention shown in figure 3, during the milling of work gear 12, work gear 12 and swiveling table rotate with a particular speed ratio each other. So the modified lengthwise curvature method in the present invention is belong to generate method.

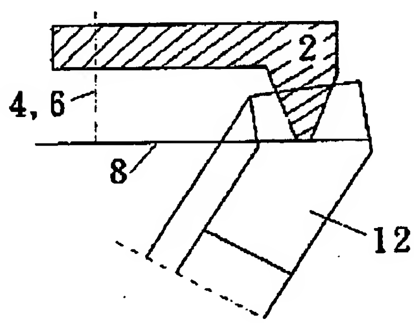

Figure 1

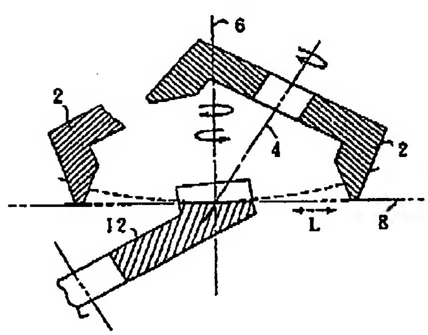

Figure 2

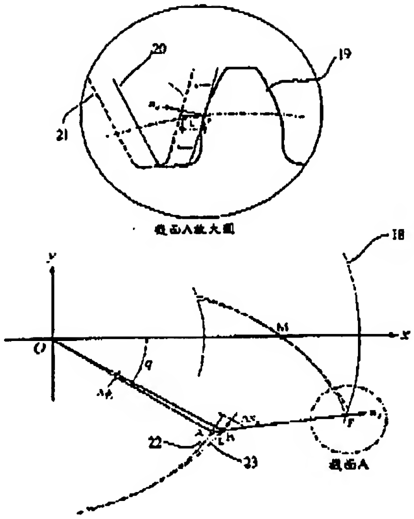

Figure 3

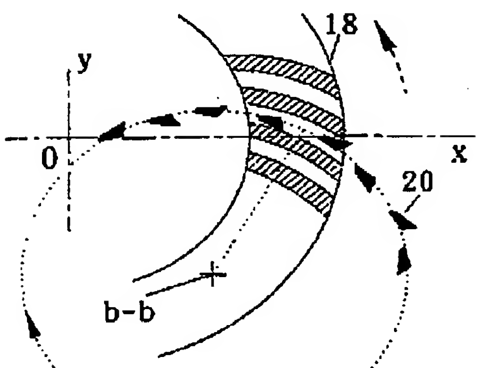

Figure 4

Illustration 2

From the technical experience, an imaged gear 18, as shown in fig 4, fixed on workholder x-y plane, the imaged gear is rotating around a-a axis (as shown in figure 4) of swiveling table, the moving trace of tool 20 represents one tooth of the imaged gear 18, the tooth surface is processed from cutting by the contacting of working gear 19 and imaged gear 18.

As in Krenzer's patent, when processing the working gear 12 as shown in figure

2, there is an anger D between rotating axis 4 of tool 2 and tool theoretical rotating axis 6, tool 2 not only rotate with its own axis 4 but also oscillates with tool theoretical rotating axis, and the tool rotating axis 4 correspond to tool theoretical rotating axis 6 processing tooth surface modification by a reciprocating curvature motion along working gear root line 8. At this time the working gear 12 and the swiveling table are standing still without rotation. There is no relationship between the imaged gear and the working gear motion. For said modified radial motion method of Krenzer's patent application is that the radial position of the tool is changing with time during the reciprocating curvature motion causing by tool rotating axis 4 corresponding to tool theoretical rotating axis 6 along working gear root line 8.

As in the present invention, when processing modified lengthwise curvature method as shown fig 2, tool rotates around its own rotating axis b-b, and oscillates around swiveling table axis a-a too. AT this time the distance between tool rotating axis b-b and swiveling table axis a-a (tool radial position) is variable, so the swiveling table anger has to be micro adjusted for processing imaged gear tooth surface modification. Nevertheless there is some motion relationship existing between imaged gear and working gear. For the said modified radial motion method in Fong's patent application, the vector n_d from tool 20 along working gear 19 displace a distance L, under condition of keeping geometry shape of tool 20 unchanged, the tool radial position on platform and swing table anger should be micro adjusted ΔS_R and $\Delta \Phi_C$ simultaneously. Therefore while process imaged gear lengthwise curvature correction, the distance (tool radial position) between the tool rotating axis and the swiveling table axis is variable, there is a certain motion relationship existing between imaged gear and working gear.

Illustation 3

As in Krenzer's patent (US-5,088,243) as shown in figure 2, when processing of modified lengthwise curvature method, tool 2 rotates not only with its own rotating axis, but also oscillate with swing table axis 6. Also corresponding to swing table axis 6 along root line 8 perform a reciprocating curvature motion. As shown in illustration 5, the tooth form in the middle of tooth surface of a gear is coincided before and after modification (as ellipse dotted line shown in fig 6), nevertheless the tooth surface zone adjacent to the middle point has obvious change in lengthwise curvature before modification. For there is an anger between the contacting ellipse and the lengthwise of tooth surface, therefore induced an obvious change of bearing ratio.

As in the present invention, when lengthwise curvature modification is processing as shown in fig 7, the rotating axis of tool 20 before and aftermath of modifications, their moving trace adjacent to the middle of generate tooth surface is almost overlapped (as shown in dotted lines in figure 7), it means that the working tooth surface coincide before and aftermath of modification, therefore induced no obvious change of bearing ratio almost, it is some improvement. It could be seen obviously from tooth surface error in fig 8 that the present invention is belong to generate method.

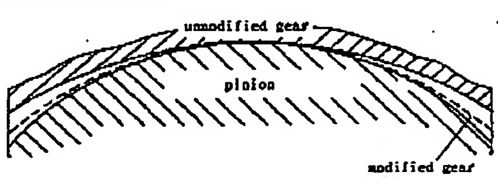

Figure 5

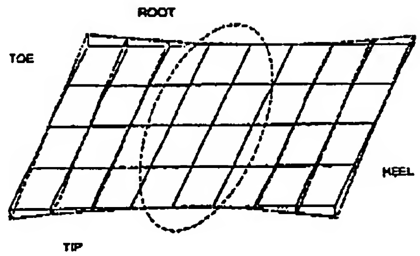

Figure 6

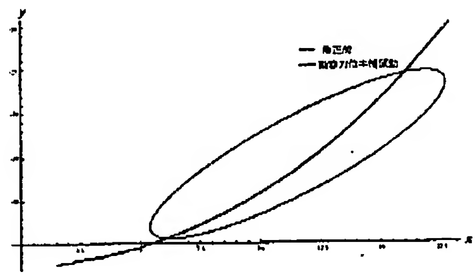

Figure 7

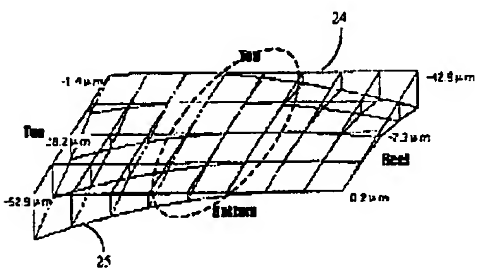

Figure 8

Conclusively, this reference can be clearly distinguished from the present invention.

It is now believed that the subject Patent Application has been placed in condition of allowance, and such action is respectfully requested.

Respectfully submitted,

Leong C Lei

Signature

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Registration No. 50402 October 13, 2005